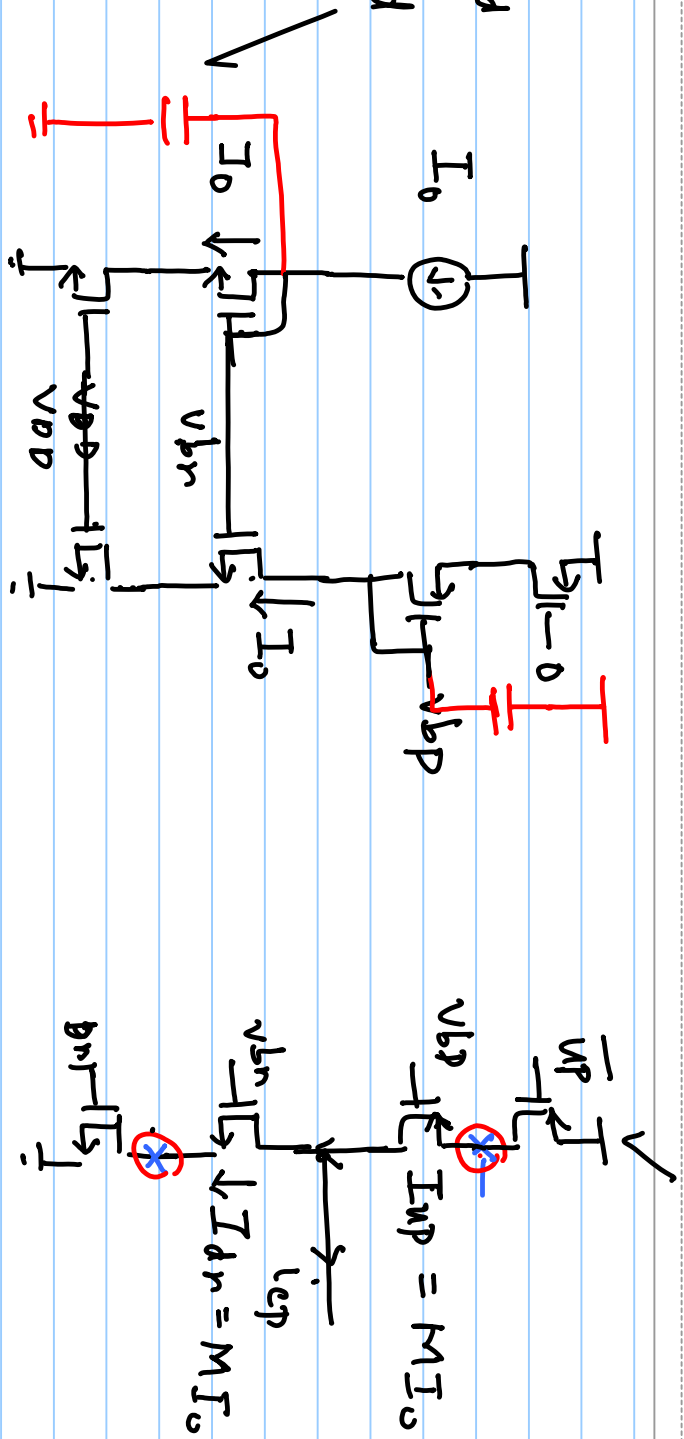


Lecture # 34

Charge pumps

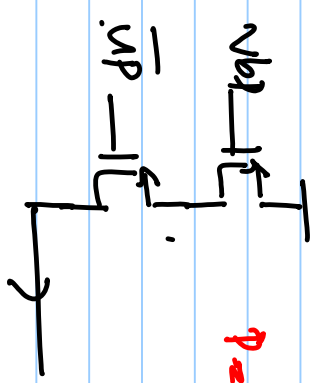
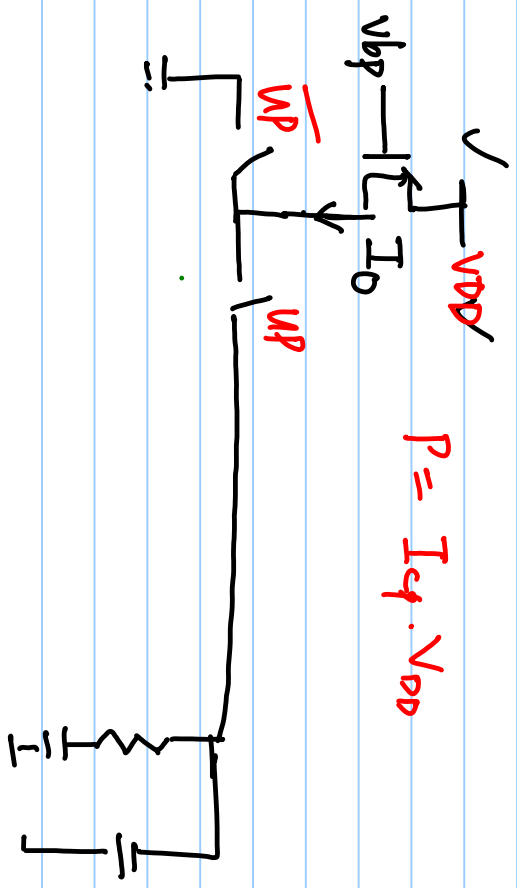
1. Source-switched
2. Drain-switched
3. Gate-switched

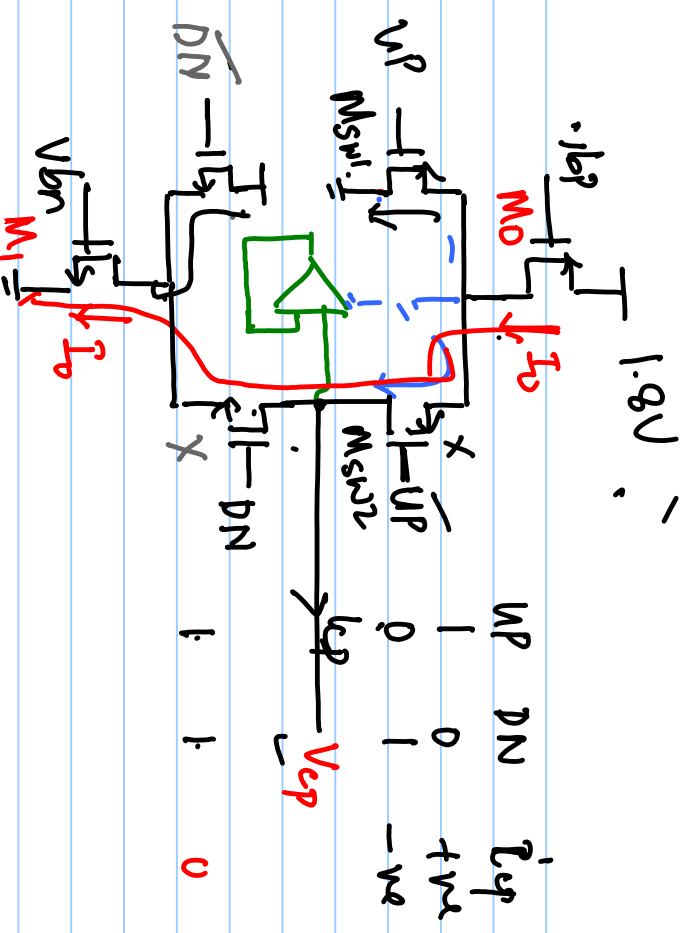


$$P = I_{eq} \cdot V_{DD}$$

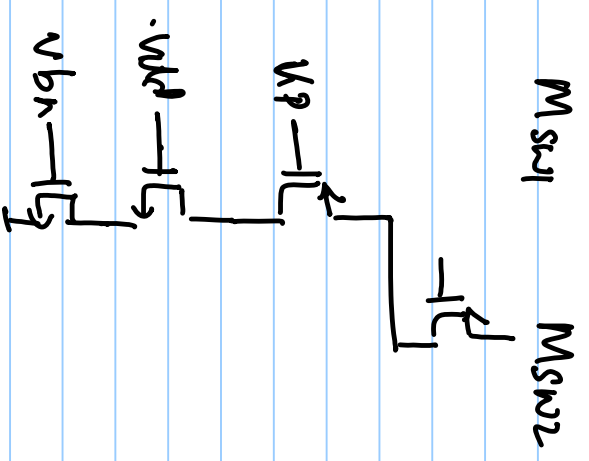
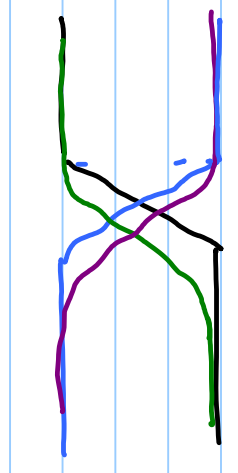
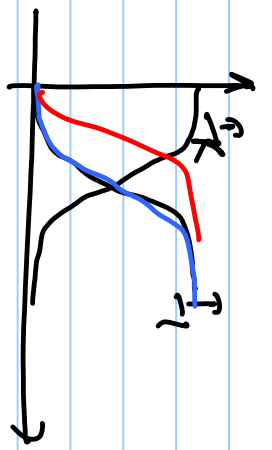
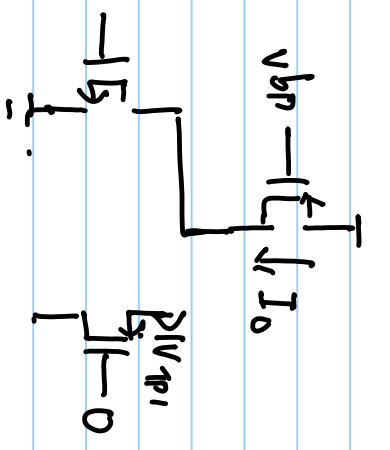
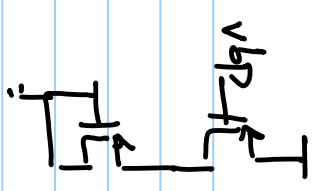
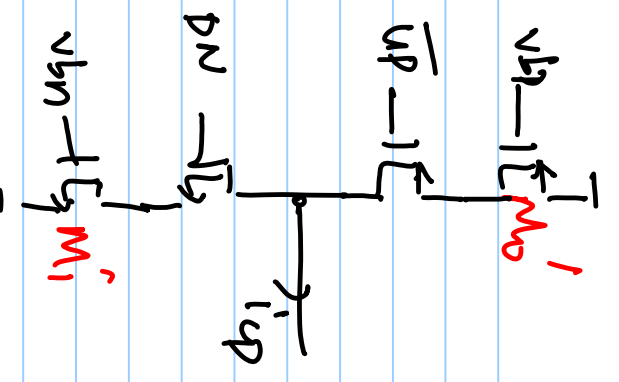
$$I_{up} = I_{dn} = M I_0 = I_{cp}$$

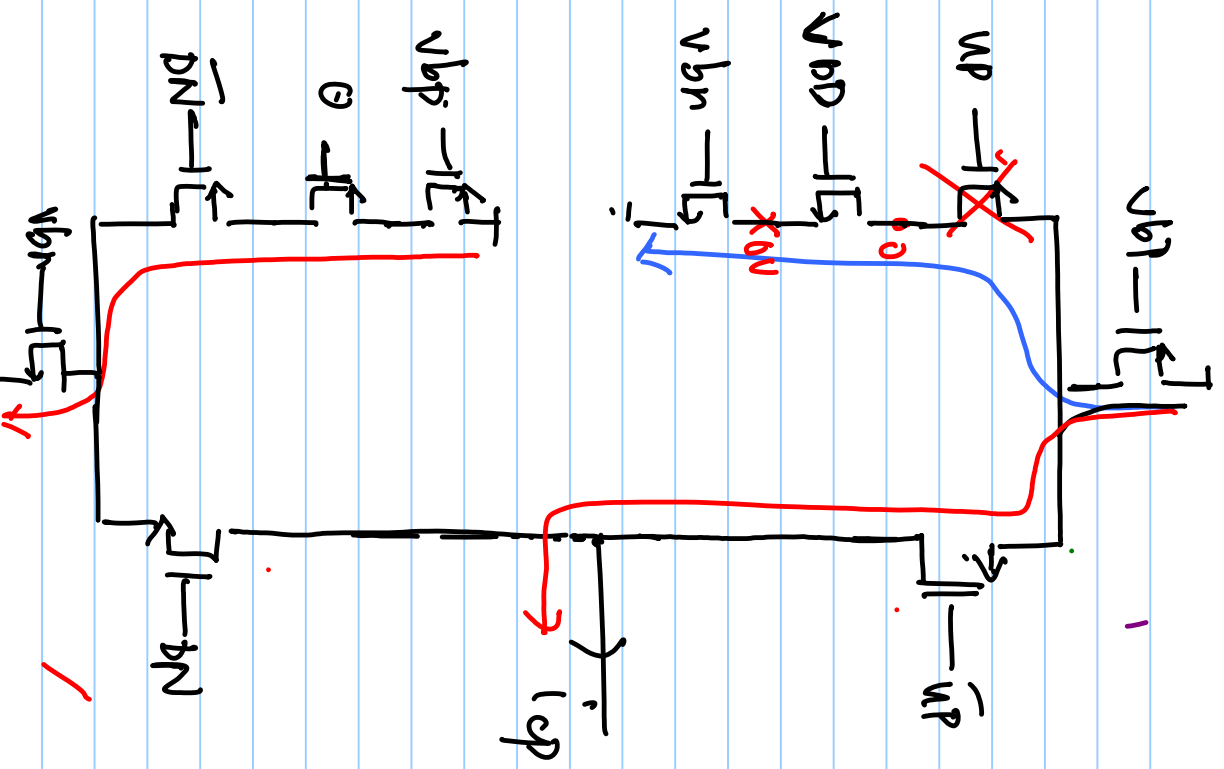
$$P = I_{cp} \cdot V_{DD} \times \frac{I_{RS1}}{I_{Tq}}$$



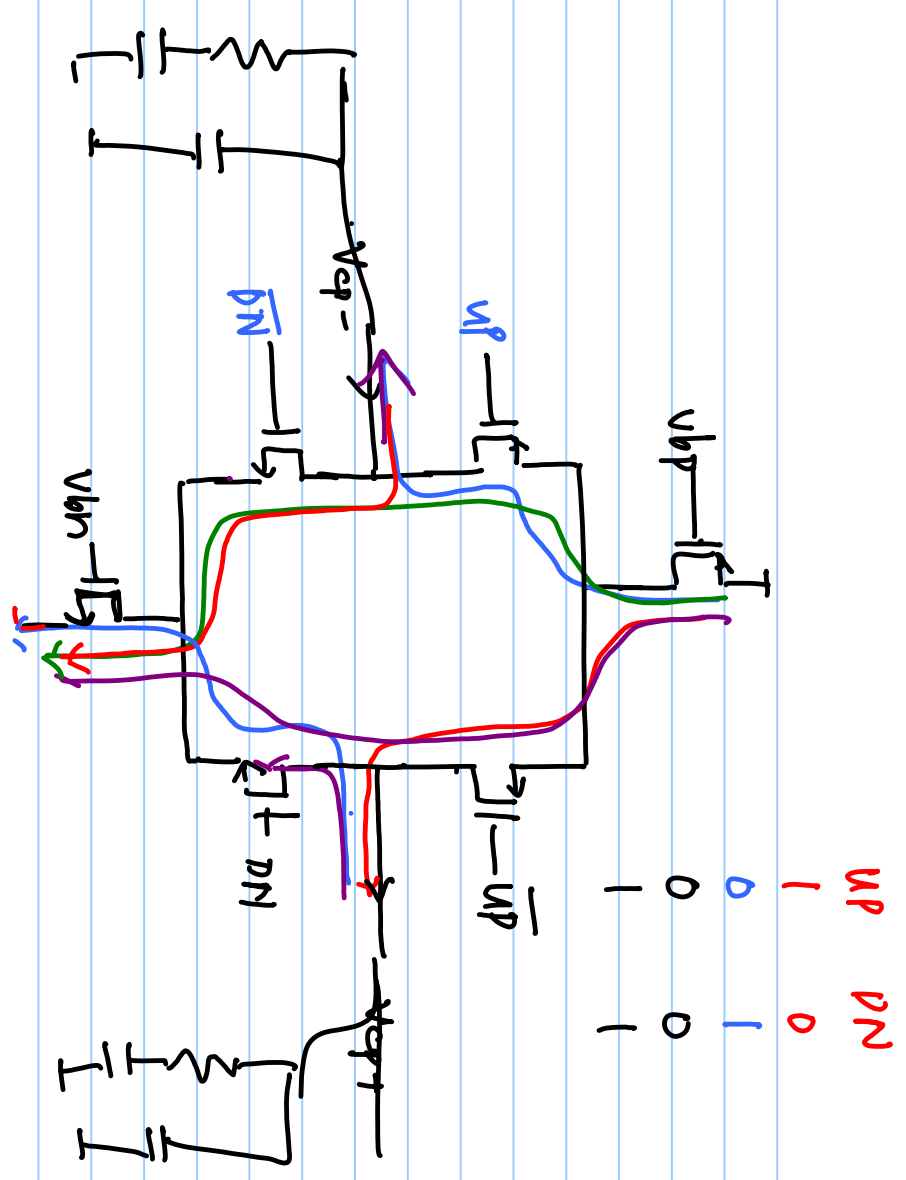


UP	DN	i_{cp}
1	0	$+v_c$
0	1	$-v_c$
0	0	0

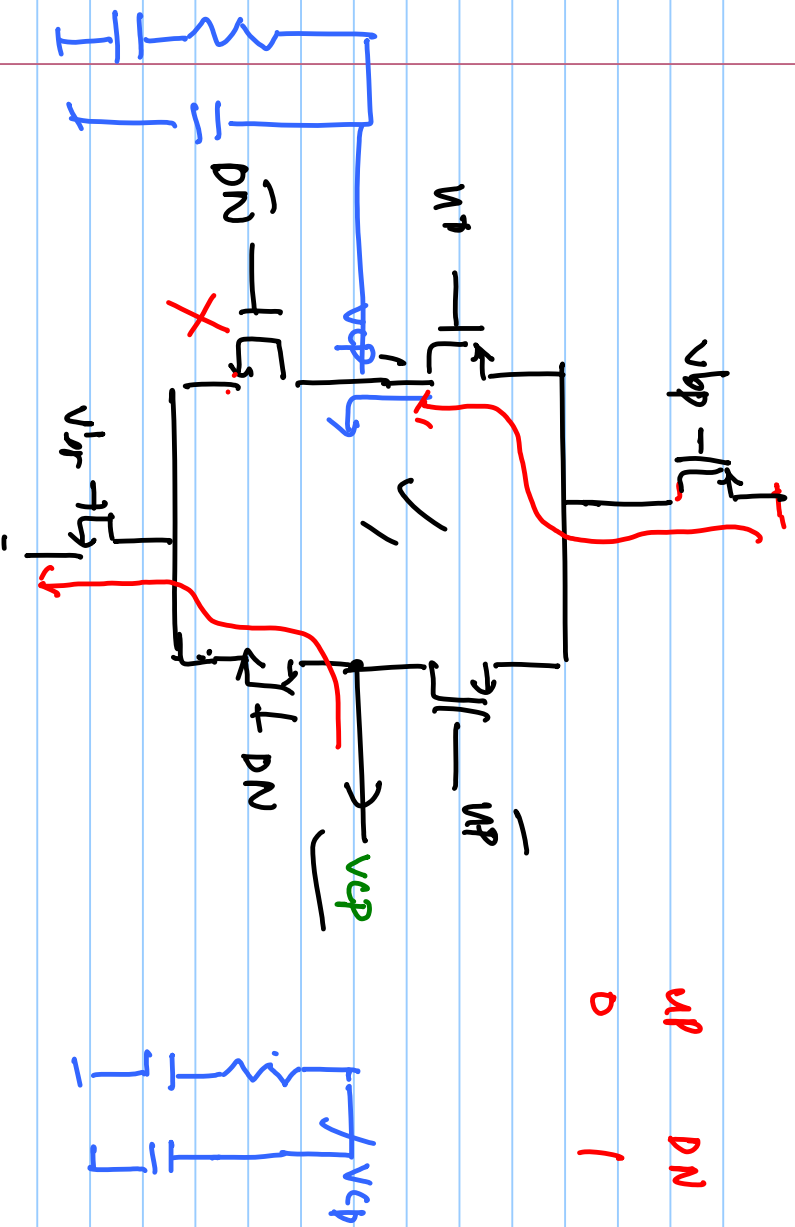




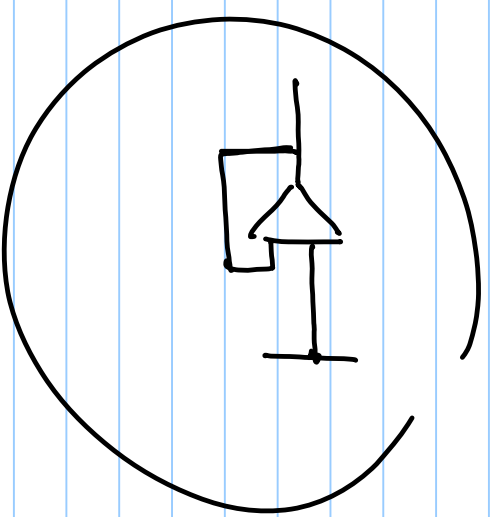
$$(V_{q+}) - (V_{q-})$$



UP	1	0
DN	0	1



0 1



1. Mismatch between I_{up} & I_{dn}
 2. Mismatch between switching thresholds.
- } $R_d \cdot C_{out}$

